

**WHAT IS CLAIMED IS:**

- 10050014-011702
1. An electroplating solution for plating tin-bismuth solder coatings comprising:  
a sulfonic acid electrolyte;  
a tin compound soluble in the electrolyte to form a tin sulfonate;  
a bismuth compound soluble in the electrolyte to form a bismuth sulfonate;  
a non-ionic surfactant;  
a grain refiner; and  
an antioxidant.
  2. The electroplating solution of claim 1 wherein the tin compound comprises a tin sulfonate.
  3. The electroplating solution of claim 1 wherein the bismuth compound comprises a bismuth sulfonate.
  4. The electroplating solution of claim 1 wherein the tin compound comprises tin methanesulfonate and the bismuth compound comprises bismuth methanesulfonate.
  5. The electroplating solution of claim 1 wherein the sulfonic acid electrolyte comprises a soluble alkane or alcohol sulfonic acid containing 1-5 carbon atoms.
  6. The electroplating solution of claim 1 wherein the sulfonic acid comprises methanesulfonic acid.

7. The electroplating solution of claim 1 wherein the non-ionic surfactant comprises polyethylene glycol-block-polypropylene glycol with a molecular weight between 2000 and 10,000.

8. The electroplating solution of claim 1 wherein the non-ionic surfactant comprises polyethylene glycol-ran-polypropylene glycol with a molecular weight between 2,000 and 10,000.

9. The electroplating solution of claim 1 wherein the non-ionic surfactant comprises ethylenediamine tetrakis polyethylene glycol-block-polypropylene glycol tetrol with a molecular weight between 2,000 and 7,000.

10. The electroplating solution of claim 1 wherein the antioxidant comprises polyhydroxybenzine.

11. The electroplating solution of claim 1 wherein the grain refiner comprises an acrylic acid.

Sub  
All

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